*On the Hypothesis of the Babylonian Origin of the so-called Lunar Zodiac—By* G. Thibaut.

That the lunar zodiac, or system of lunar mansions, which we find in use since an early time among several Asiatic nations, notably the Arabs, Hindus and Chinese, had originally been established in Babylon, was a conjecture, first thrown out by Professor A. Weber.[1] Direct proofs of such a zodiac having been recognised by the Chaldean astronomers were, indeed, not given by that scholar. A few facts were quoted which seemed to lend some countenance to the hypothesis in question; but that these facts had by themselves little proving force was admitted by the author of the hypothesis himself. That, under these circumstances, the hypothesis was put forth at all, was due to the conviction that the striking similarities displayed by the lunar zodiacs of the three nations mentioned, could be satisfactorily accounted for, only on the assumption of there having been a true historical connexion between them, while, at the same time, difficulties of various kinds seemed to preclude the assumption of the zodiac having been first devised by one of the three nations, and later on, borrowed by the other two. It thus presented itself as a not unlikely way out of the difficulty, to assign the invention of the lunar zodiac to the centrally situated Babylon, which, moreover, was known to have been one of the earliest seats of astronomical observation and speculation, and to suppose that from thence were derived at a very early period the different lunar zodiacs positively known to us.

Viewed in this way, the hypothesis was indeed by no means destitute of plausibility. It did not enter into conflict with any known facts, and seemed to offer openings for the removal of certain difficulties which attached themselves to other theories. Hence it was, if not adopted, at least referred to as not improbable by several competent enquirers. That others again, less cautious, and perhaps less fully acquainted with the intricate character of the evidence, proceeded to

[1] See Weber's History of Indian Literature (first German Edition, 1852, p. 21), and the first of his Essays on the Nakshatras, 1860, *passim.*

state as an undoubted fact, what certainly was only a fairly plausible conjecture, was what generally happens in such cases, and can in no way be laid to the fault of the distinguished author of the hypothesis.

At the time when Professor Weber first formulated his views on the probable origin of the Nakshatras (to use the term by which the Hindus designate the constituent asterisms of their lunar zodiac), hardly anything was known about the astronomical doctrines of the Babylonians, but what we learn from Greek and Roman authors. These writers do not indeed say anything about a lunar zodiac; but as their accounts cannot be considered as in any way exhaustive, no great stress could be laid upon this absence of testimony on a particular point. During the last forty years, however, rapid progress has been made in the decipherment of the original records of Babylonian and Assyrian literature, *i.e.*, the very numerous inscriptions in cuneiform characters engraved on stone and clay tablets, which have been excavated from the heaps of ruins covering ancient Chaldean soil, and are at present preserved in the great Museums of Europe, principally the British Museum. Among these records of the past, numerous texts of astronomical and astrological character came to light, some of which have been published—chiefly in the ' Inscriptions of Western Asia,' edited by the authorities of the British Museum,—and several scholars, soon after, attempted to elucidate the meaning of those difficult documents. Of the scope and value of these earlier attempts to re-construct the system of Chaldean astronomy we cannot speak here in detail. To the general difficulties besetting all interpretation of cuneiform documents, there are added, in the case of astronomical texts, special difficulties of a truly formidable nature, and we, therefore, need not be astonished, when finding, that, for some time, no results were reached that could be accepted with any confidence. As far as the question of the lunar zodiac is concerned, nothing was discovered that favoured the hypothesis of its Chaldean origin. But owing to the fragmentary nature of the texts interpreted, and the doubts attaching to the interpretations, there was, after all, no reason for giving up the hope that evidence confirming that hypothesis might be traced at some future time.

A few years ago, however, an enormous advance in our knowledge of Babylonian Astronomy was effected by the publication of the results of the researches which two distinguished scholars, Fathers Epping and Strassmaier, had carried on in co-operation.[1]   F. Strassmaier had succeeded in discovering, among the treasures of the British Museum, some astronomical tablets which were distinguished from the mass of

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[1]  F. Epping S. J., *Astronomisches aus Babylon.*   Freiburg, 1889.

similar documents by being clearly dated in a known era, so that astronomical calculation could be resorted to for the interpretation of their contents. I cannot, interesting as it would be, give in this place an account of the steps by which F. Epping, throughout assisted by the vast philological and palæographic learning of F. Strassmaier, arrived at a convincing and almost complete interpretation of the contents of those tablets ; how, by calculations and reflections continued through many years, he succeeded in eliminating one unknown quantity after the other ; and thus in the end establishing a firm basis for all future research in this field. Nor can I here undertake to give a full account of the nature of the results worked out. Of these so much only will be concisely stated as may be considered to bear on the question treated of in this paper.

It appears from the astronomical tablets interpreted, that the Babylonian astronomers were in the habit of referring the positions of the five planets to a certain number of fixed stars situated near the Ecliptic. The tablets explained, in the book above referred to, are supposed by Professor Epping to contain what he calls planetary ephemerids, *i.e.*, methodical statements of the places of the planets, as calculated before hand for a certain period of time. Other tablets of a generally similar nature, which Professor Epping has since published and translated in the ' Zeitschrift für Assyriologie,' are supposed by him to embody the results not of previous calculation but actual observation. It may in some cases be difficult of decision whether a certain tablet contains a statement of calculations or of observations; for, so far, we do not know with what degree of accuracy the Babylonians either were able to predict the positions of the planets, or cared to observe and record their actual positions. Professor Epping naturally supposes that, wherever the statements are very nearly accurate, *i.e.*, very nearly agree with the positions of the planets, as determined for that time by the methods of modern astronomy, we have to do with records not of calculation but actual observation. The decision of this important question does not, however, concern us here.

A few examples quoted from Professor Epping's book will serve to illustrate the Babylonian method of stating the places of planets. One of the tablets says, that in the night of the 20th of the month Airu (April to May) of the year 189 of the Seleucidan Era ( — 122) Venus appeared (or was to appear) in the eastern sky, and above her the western star of the head of the Ram, at a distance of four yards. Again we read that in the night of the 26th of the month Abu (July to August) of the same year, Mars appeared (or was to appear) in the eastern sky, and above it the western star of the mouth of the

Twins, at the distance of eight inches.  A. S. O.  The observations—or calculations—recorded, comprise positions of all the five planets. We cannot in this place dwell at length on the elaborate and ingenious processes by which F. Epping succeeded in identifying the planets and the fixed stars—normal stars, as F. Epping calls them—to which the places of the planets are referred, nor can we discuss the methods employed by the Babylonian astronomers in determining and expressing these places.  We are concerned only with the results arrived at by F. Epping, and these seem so well assured, that we need not hesitate to accept his identifications *in toto*, so that we have trustworthy information about a number of stars—none of them far from the Ecliptic—which the Babylonian Astronomers used as their fundamental stars.  The planetary tables analysed in Epping's book mention twenty-eight such stars (or rather twenty-nine, if we take into account γ Cancri, mentioned in the Note to Epping's Constellation xiii, p. 126). But since the publication of that book, Epping and Strassmaier have continued their researches and succeeded in explaining some further planetary tablets—constructed on much the same lines—which supply a few more normal stars, so that a list published in the December part of the *Assyriological Review* for 1892, contains altogther thirty-three normal stars.  Whether just so many normal stars were recognised by the Babylonian Astronomers, or whether the future decipherment of further tablets will add to that number, we are not at present able to say.  Taking into account that the Babylonians manifestly aimed at a considerable degree of accuracy in their observations, and possibly predictions, the former alternative would not, *a priori*, appear improbable. But the fact, on the other hand, that so far, in all the Tablets explained, only thirty-three stars have been met with, while, most probably, there would have been more than once an opportunity of mentioning other stars also, seems to indicate that for some reason or other a limited number of stars had been singled out once for all, and that to them only the positions of the planets were referred.  The number of these stars may, of course, have exceeded thirty-three to some extent.  A conjecture made by Professor Hommel with reference to this point does not lack plausibility.  According to a well-known passage in Diodorus, the Chaldeans taught that thirty stars, called the ' Counsellor Gods,' were ranged under the planets,—fifteen above and fifteen below the earth—one of which went every ten days from the upper to the lower regions.  From the last mentioned item of doctrine, Professor Hommel concludes that we have to read, in the text of Diodorus, ' thirty-six ' instead of ' thirty,' 36 × 10 being equal to 360, the approximate number of the days of the year ; and seems inclined—if I rightly apprehend

his meaning—to identify those thirty-six Counsellor Stars with the normal stars selected by the astronomers. This is a not unlikely conjecture, and we, therefore, may expect to meet, by and bye, in Babylonian texts, with three further stars employed as normal stars.

We now come to the special topic of the present paper, *viz.*, a critical examination of the views set forth not long ago by the distinguished Assyriologist, Professor F. Hommel, of Munich, on the connexion of the series of normal stars employed by the Chaldean Astronomers, with the lunar zodiacs acknowledged by the Arabs, Hindus, and Chinese.[1]

Professor Hommel is of opinion that the results of the researches carried on by Epping and Strassmaier suffice to raise beyond doubt, the truth of the conjecture first hazarded by Professor Weber, as to Babylon having been the place where a series of lunar stations was first established, and from which that series, more or less modified, was borrowed by the other nations. But as the Babylonian series on the one hand, and the series acknowledged by the Arabs, Hindus and Chinese, on the other hand, are by no means altogether identical — as indeed sufficiently appears from what has been said, so far, about the Babylonian normal stars, — there arises the necessity of accounting for the various discrepancies, and showing that they have to, or may, be viewed as later variations. We will follow Professor Hommel through the different steps of the argumentation by which he attempts to effect this.

The point in which the series of Babylonian normal stars most obviously differs from the well-known lunar zodiacs is, of course, that the latter comprise twenty-seven or twenty-eight stars, or groups of stars, while the Babylonian series numbers thirty or more stars. This discrepancy — Professor Hommel attempts to remove by undertaking to show — that the Babylonian series, as well as the lunar zodiac of the Arabs and other nations, originally comprised, all of them, twenty-four members only. First, as to the Babylonian series. Professor Hommel has compiled from Epping's book, a series of thirty-one stars,[2] (of which one, however, *viz.*, No. 26, is not actually met with in the Tablets, but due to an hypothesis of Professor Hommel's) ; while, as remarked above, the list published by Epping and Strassmaier in the *Z. F. Ass.*

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[1] ' Ueber den Ursprung und das Alter der Arabischen Sternnamen und insbesondere der Mondstationen ' von Fritz Hommel ; Zeitschrift der Deutschen Morgenländishcen Gesellschaft, Vol. 45, pp. 592–619.

[2] Pp. 610–12 ; of Professor Hommel's paper.—The list numbers thirty stars only, but this is due to the mistake of one star (*Pulukku* = α Cancri) having received no running number.

contains thirty-three stars. Strictly speaking, Professor Hommel, or any one espousing his views, would, therefore, have to show that not only the series of thirty-one stars, but also that which comprises two further stars, admits of being reduced to a series of twenty-four members. The difference of the two series is, however, of no great importance as far as the matter in question is concerned: for on the point of view adopted by Professor Hommel, the larger as well as the smaller list doubtless admits of reduction. This plan is to combine into one asterism (or station, to use the term employed by Professor Hommel) all those stars which are shewn by their names to have been viewed by the Babylonians as closely connected. The Babylonian list no doubt comprises a number of stars which were considered to constitute pairs: the two stars which Professor Epping by his calculations has identified as, $\beta$ and $\zeta$, Tauri, are designated on the tablets as the northern and southern *šur narkabti* (translated by Professor Hommel as 'ox of the wain'); $\eta$ and $\mu$, Geminorum, are called the western and the eastern star of the mouth of the Twins; $\alpha$ and $\beta$, Geminorum, appear as the eastern and western Twins; $\gamma$ and $\delta$, Cancri, are called the southern and the northern one of *pulukku* (translated 'Spindle' by Professor Hommel); $\alpha$ and $\beta$, Librae, are called the southern and the northern one of the Balance; $\gamma$ and $\delta$, Capricorni, appear as the western and the eastern one of—according to Professor Hommel's translation—the goat-fish; $\alpha$ and $\beta$, Arietis, are called the eastern and western one of the head of the Ram. Fourteen single stars thus being combined into seven pairs of stars, the list of thirty-one stars is reduced to one of twenty-four members, part of them pairs of stars, and part single stars. Epping's list of thirty-three stars appears to comprise eight pairs of stars, the counting of which as single stars would bring the number down to twenty-five. But it would probably not be difficult, by some further combination, to reduce this latter total by another unit, and thus again to arrive at what might be called a zodiac of 24 asterisms or stars.

Next, as to the lunar zodiacs of the Arabs, Hindus and Chinese. Here also Professor Hommel labours to show that these zodiacs, in their original form consisted of no more than twenty-four members. This argumentation concerns itself with the Arabic Zodiac chiefly, and the means by which he undertakes to reduce the twenty-eight stations of that zodiac to an earlier series of twenty-four is as follows:—

He in the first place, assumes the two stations *al-Fargh al-awwal* ($\alpha$ and $\beta$, Pegasi) and *al-Fargh as̠-s̠ānī* ($\gamma$, Pegasi, and $\alpha$, Andromedæ) to have originally constituted one station only, on the ground that in all the older passages which mention those stations, they are spoken of as

one only, called *ad-dalwu*.[1] He further maintains the twelfth station—*aṣ-Sarfah*—(β Leonis)—to have been a later insertion, chiefly for the reason that also the corresponding Indian Station, viz., *Uttara Phalgunī* appears, to judge from its name, to have originally formed one station with the preceding one, viz., *Pūrva Phalgunī.* He next suggests that No. 17—*al-iklīl* (β *d* π Scorpionis) was not originally separated from the preceding station—*az-Zubānay*—, for the reason that the name of the corresponding Indian Station, viz., *Anurādhā,* indicates that station to have once been one with the preceding station, which, in addition to its ordinary name, *viçākhā* is sometimes called *rādhā.* And he finally throws a doubt on the originality of the 21st station *al-Baldah,* with reference to the fact that the corresponding Indian Station may, on account of its name, *Uttarāshāḍhās,* be suspected to have originally constituted one station with the one immediately preceding (*Pūrvāshāḍhās*).

The lunar zodiac of the Arabs is thus reduced to a series comprising twenty-four stations. And as the four rejected stations are rejected for reasons derived from the nomenclature of the corresponding Hindu Nakshatras, it, of course, follows that those four Nakshatras also must be viewed as later additions to an original Hindu series of twenty-four members only. Professor Hommel makes some remarks tending to show that also some of the Chinese *Sieu* are later insertions in an original less extended series, he does not, however, attempt to prove that just four members of the Chinese zodiac were not original. This, however, is a point of no great importance.

Professor Hommel, thus, has established two series of asterisms — a Babylonian one and an Arab one—each of which comprises twenty-four members, and next proceeds to enquire how far the constituent members of the two series are identical. In the comparative statement of the two lists, however, given by him on page 613, he exhibits, not the reduced Arabic list, but the ordinary list of twenty-eight stations. We may follow him therein (since, in a comparison of the individual stars of the two lists, it does not make much difference whether we arrange them in twenty-eight or twenty-four stations), and, therefore, here re-produce the list as drawn up by Professor Hommel *in extenso.*

| *Babylonian Series.* | | *Arabian Series* |
|---|---|---|
| 1. timinnu, η Tauri ... | ... | aṭ-ṭuraiyā, η Tauri. |
| 2. pidnu, α Tauri ... | ... | al-debarān, α Tauri. |

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[1] To this we must add—following a line of reasoning adopted by Professor Hommel in three other cases—that also the names of the corresponding Nakshatras (*Pūrva-Bhadrapadās* and *Uttara-Bhadrapadās*) point to the fact of there having originally been one station, which, later on, was divided into two.

|  | *Babylonian Series.* | *Arabian Series.* |
|---|---|---|
| 3. | šur narkabti, β α. ζ Tauri | al-haq'a, λ, φ,[1] φ[2] Orionis. |
| 4. | pū tu'āmi, η, μ Geminorum | al-han'a, η, μ, ν, γ, ξ Gemino- |
| 5. | tu'āmi, ša re'i, γ Geminorum | rum. |
| 6. | tu'āmi, α, β Geminorum | ad-dirā, α, β Geminorum. |
| 7. | pulukku, γ, δ Cancri | an-natra, γ, δ Cancri. |
| 8. | rīs arī, ε Leonis | at-tarf, λ Leonis. |
| 9. | šarru, α Leonis | al-gabha, α Leonis. |
| 10. | māruša ríbu arkat, šarri ρ Leonis | az-zubra, δ, θ Leonis. |
| 11. | zibbat arī, β Leonis | as-sarfa, β Leonis. |
| 12 | šipu arkū ša arī, β Virginis | al-'awwā, β η, γ Virginis. |
| 13. | šur ardati, γ Virginis | |
| 14. | nābū ardati, α Virginis | as-simāk, α Virginis. |
|  |  | al-ghafr, ι, κ, λ Virginis. |
| 15. | zibānītu ; α, β Libræ | az-zubānay α, β Libræ. |
| 16. | rīs akrabi ; δ, β Scorpionis | al-iklīl ; δ, π, β Scorpionis. |
| 17. | habrud ; α Scorpionis | al-qalb, α Scorpionis. |
| 18. | mātu ša kasil, θ Ophiuchi | as-saula, λ, υ Scorpionis. |
|  |  | an-na 'āyim.  Sagitt. |
|  |  | al-balda.  Sagitt. |
| 19. | karan sug'ur ; α, β Capricorni... | ad-dābih ; α, β Capricorni. |
|  |  | bula ; ε, μ, ν Aquarii. |
| 20. | sug'ur ; γ δ Capricorni | as-su'ūd ; β, ξ Aquarii. |
| 21. |  | al-ahbiya ; α, γ, ζ, η Aquarii. |
| 22. |  | ad-dalwu ; α, β, γ Pegasi, α An- |
|  |  | dromedæ. |
| 23. | rikis nūni ; η (Piscium) | al-hūt ; β Andromedæ. |
| 24. | rīs kusarikki ; α, β Arietis | an-nath ; β, γ Arietis. |
|  |  | al-butain : a, b, c Muscæ. |

Observing that in the above two lists the stars constituting sixteen stations are absolutely identical, while there is an approximate agreement in six further cases, Professor Hommel considers himself justified in concluding that ' there cannot be any doubt that the planetary stations made use of by the Babylonians at the time of the Arsacide Kings, and the Arabic (as well as the Indian and Chinese), lunar stations are based on one and the same more ancient original.

Now this conclusion I feel altogether unable to accept.—In the first place there arises the difficulty of accounting for the acceptation of a zodiac of twenty-four asterisms, and its later transformation into one of twenty-eight members, by the Hindus, Arabs and Chinese alike. That the Babylonians who manifestly possessed from old times a real solar zodiac of twelve signs should at some later time have subdivided

J. I. 20

each station of that zodiac into two parts, is intelligible; for divisions comprising thirty degrees each naturally would, for many purposes, be found inconveniently large. For the same reasons we can understand the establishment of a series of thirty-six stars, three for each sign of the zodiac. I do not see any proof of a series of twenty-four stations having ever actually been employed by the Babylonians; but as said just now, a motive for its formation is at any rate imaginable, in the case of those who, as a matter of fact, started with a zodiac consisting of twelve parts. But for what purposes should we imagine that hypothetical zodiac of twenty-four members to have been borrowed by the other nations? What we positively know is that the Hindus, Arabs and Chinese possessed zodiacs comprising twenty-eight or twenty-seven members, *i.e.*, zodiacs having a special reference to the moon's motion. Professor Hommel would have us believe that the Chinese, Arabs and Hindus independently borrowed from the Babylonians a zodiac of twenty-four asterisms; that this zodiac was afterwards expanded by the Chinese into one of twenty-eight members; that the Hindus independently did the same; and that the Arabs finally added four members to their zodiac at the time when they became acquainted with Hindu astronomy. Now the zodiac of the Hindus is from the earliest time at which it appears a decidedly lunar one; the *nakshatras* are primarily those asterisms with which the moon in her periodic revolution successively enters into conjunction, and that the Hindu Series of twenty-eight or twenty-seven asterisms should have been preceded by one of twenty-four members, is therefore, *á priori*, quite improbable. The same may be said of the Arab *manzils*; and also of the Chinese *sieu*. The lunar character of the *sieu* is not so clearly apparent as that of the *nakshatra* and *manzil*. But just for that reason an amplification of an earlier list of 24 asterisms—which would have fully satisfied all practical requirements—into one of twenty-eight members is all the less probable.

Professor Hommel speaks in several places of the twenty-four 'lunar' stations. But a series of twenty-four stations can in no way be called 'lunar.' A 'lunar' zodiac—whether we understand thereby a zodiac of lunar origin or one of prevailingly lunar application—can be constituted only by a series of either twenty-seven or twenty-eight asterisms.

There are further considerations which render improbable the hypothesis of the Babylonian Series of normal stars having been the prototype of the different lunar zodiacs. With the Arabs as well as the Hindus and Chinese, the twenty-eight or twenty-seven members of their zodiacs appear from the very outset as stations, *i.e.*, sections of

the ecliptic, dividing the course of sun, moon, and planets into a number of parts. These sub-divisions may be viewed either as abstract fractional parts of the ecliptic, irrespective of any stars or asterisms; or else they may be conceived as marked by certain stars or groups of stars. In ancient Arabic literature the latter aspect prevails on the whole; the different seasons of the year are discerned and distinguished according to the successive risings of the stars or groups of stars that mark the stations. But at the same time there are other passages which refer to the moon or sun as being within a station, and in which therefore the character of the stations as sub-divisions of the ecliptic appears very clearly. In Sanskrit literature the *nakshatras* came at a very early period to be prevailingly viewed as subdivisions of the path of the moon and sun, although the more sensuous character of the stations as asterisms was by no means forgotten.

Among the Chinese finally the *sieu* although defined by groups of stars are generally used only as subdivisions of the ecliptic: they in fact hold in Chinese astronomy a position strictly analogous to that of the signs of the zodiac among Western nations. It is true that in one point the Chinese zodiac has preserved a more unmistakable mark of its origin than the zodiacs of the more Western nations, *viz.*, in the inequality of extent of the twenty-eight *sieu*. For this inequality can be explained only by the fact that the twenty-eight subdivisions of the ecliptic were made to correspond to twenty-eight groups of stars of, naturally, unequal extent.

It thus appears that Arabs, Hindus, and Chinese alike used the stations of their lunar zodiacs in the same way as we use the signs of our zodiac, *i.e.*, as subdivisions of the sphere, and thereby of the path of sun, moon and planets. If, therefore, the lunar zodiacs of those three nations were mere adaptations of an original Babylonian zodiac of twenty-four or more asterisms, we should expect that also the asterisms constituting that Babylonian zodiac should have been employed for the purpose of subdividing the ecliptic into as many parts, to which the motions of sun, moon and planets are referred. But, as an examination of the Babylonian planetary tablets teaches, this is by no means the case. As stated above, those tablets when intending to fix the position of a planet with accuracy, refer it to one of the normal stars. When on the other hand the Babylonian astronomers could not—or else did not care to—define the place of a planet very exactly, they merely say in which of the twelve zodiacal constellations it was at the time. The tablets say, *e.g.*, that on the evening of the 4th Airu—122, Mercury heliacally set in *te-te* (Taurus); and that on the 8th Tishritu—110, Mars heliacally rose in

nūru (Libra). The Babylonian names of the twelve constellations of the zodiac are given in Epping's work, p. 149, (*cf.* also the discussion of these names by Strassmaier, pp. 170-173), and a second rectified list is furnished in the *Zeitschrift für Assyriologie* for December 1892, p. 223. We may also compare on this point Professor Hommel's paper under discussion, pp. 610-12; and Professor Jensen's '*Kosmologie der Babylonier,*' pp. 57-95 and 495-501.

According to the results arrived at by these scholars, the Babylonian names of the zodiacal constellations agree, on the whole, with the Greek ones; the most striking exception being that, in the place of Cancer, the Babylonians have a term *Pulukku* which is said to mean a 'spindle.' And there seems no longer to prevail any doubt that the solar zodiac, with its twelve signs, was first invented by the Babylonians, and employed by them from a very early period. The need, therefore, which, in the case of other nations, supplied the chief reason for the establishment of a lunar zodiac, *viz.*, the need of some subdivision of the zodiac into parts to which the motions of the heavenly bodies could be referred, did, as far as we can see back, not exist for the Babylonians, who already possessed a subdivision of the zodiac into twelve parts.

A comparison of the designations of the Babylonian normal stars with the names of the lunar stations among the Arabs, Hindus, and Chinese, suggests similar conclusions. The names of these latter point throughout to an independent series of asterisms, *i.e.*, the name of each station indicates a star or group of stars, considered to constitute an independent whole by itself, not forming part of a larger group or constellation. We must modify this general statement with reference to those Arab and Hindu stations which, by their designations, as 'first' and 'second,' or 'earlier' and 'later,' are shewn to have been viewed as parts of one more extensive constellation. But this qualification does not affect the contrast which the lunar mansions of the three nations form, in this respect, to the series of Babylonian normal stars. For it is clear [1] that by far the greater number of the names of those stars point to the fact that the stars were viewed as belonging to one or other of the twelve zodiacal constellations. We have the head of the Ram, the mouth of the Twins, the head of the Lion, the tail of the Lion, the hind-foot of the Lion, the anterior bull of the Virgin, the 'messenger' (?) of the Virgin, the Balance, the head of the Scorpion, the horn of the Goat-fish, the head of the Pourer (of water; Aquarius), the foot of the Pourer; the head of the Fish. A few stars only have special names not directly pointing to any connexion of theirs with the

[1] I here have to accept the interpretations of the Babylonian names given by Professor Hommel.

zodiacal constellations ; so, *e.g.*, *pidnu* (Aldebaran) and *šarru* (Regulus). The Babylonian nomenclature of the stars near the Ecliptic thus seems, on the whole, to have been faithfully reproduced by the Greek Astronomers, who have special names for some few of the most conspicuous stars, while the great majority are simply referred to their places in the zodiacal constellations.

In spite of the preceding reflections, which tend to shew that the Babylonian series of normal stars, and the lunar zodiacs of the three nations, differ in general character, it might be maintained that the Babylonians had for some reason or other singled out a certain number of — let us say, twenty-four — ecliptical stars or asterisms, which series was later on borrowed by the other nations and variously adapted to their own purposes. This, in fact, is, as explained above, the thesis advocated by Professor Hommel. We, therefore, must now examine in detail the steps of his argumentation.

That the normal stars of the Babylonians — whether 31 or 33 or 36; or in fact any approximate number — may without much difficulty be arranged, as is done by Professor Hommel, in a series of twenty-four members has been admitted before. But it appears very much more doubtful whether we can follow Professor Hommel in the second step of his argumentation, *viz.*, the attempt to show that, also, the different lunar zodiacs in their primitive form comprised twenty-four stations only. We will no longer dwell on the circumstance of a zodiac of twenty-four stations not being a lunar one at all ; for the originally lunar character of the zodiacs under discussion might be called into question. But what positive evidence is there for any of the three zodiacs concerned ever having comprised less than twenty-eight or twenty-seven members ?—Professor Hommel does not attempt to show that the Chinese originally acknowledged twenty-four stations only; following G. Schlegel, he merely remarks (Note 5, p. 606), that *a* and *β* Pegasi, and *γ* Pegasi and *d* Andromedæ, which constitute the two *sieu* Tschi and Pi originally formed one station only. [1]

Concerning the Arab and Hindu Stations, Professor Hommel thinks, as shown above, that there are reasons for singling out four of them as later additions, and further conjectures that the addition was independ-

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[1] We need not, of course, with reference to the point under discussion, pay attention to J. B. Biot's opinion that the Chinese Stations were originally twenty-four only, to which four more were added, at about 1100 B. C. For that opinion has long been shown to have no historical foundation whatever ; and would, even if found to be true, hardly help to confirm Professor Hommel's views, since the four stations which Biot declares to be later additions (*viz.*, *Nu*, *Oey*, *Lieou* and *Ti*), are all included in Professor Hommel's hypothetical original series.

ently made by the Hindus only, and merely borrowed by the Arabs when they first became acquainted with Indian astronomy. We also have seen that Professor Hommel draws his reason for suspecting four Indian *Nakshatras* from their names. But the very indefinite indication supplied by the nomenclature certainly does not suffice to make up for the total absence of positive evidence as well as general probability. The Hindu Series, at any rate, appears from its very beginning as intimately and specially connected with the moon, [1] and we, therefore, neither expect to find, nor do we actually find, any trace of there having ever been less than twenty-seven or twenty-eight *nakshatras*. That in three cases two consecutive *nakshatras* are specially connected by having the same name—only differentiated by the addition of 'earlier' and 'later'—certainly does not suffice to prove that there originally existed a list of twenty-four stations, but can very well be accounted for by the supposition that when a series of twenty-seven or twenty-eight stations was established, there either already existed such names as *pūrva-* and *uttara-phalgunī*; or that existing names such as *phalgunī* were, for the purposes of the lunar zodiac, to be established, differentiated by the addition of *pūrva* and *uttara*; or else, the asterisms then being named for the first time, that two stations were united by a common name because they struck the eye as constituting one whole as it were. The fact is, that in each case the stars of which the three pairs of *pūrva* and *uttara* consist, form an obvious and conspicuous square, so that nothing was more natural than to comprise them under one name, even on the part of those who distinctly viewed them as two stations. But even if there should have originally been an asterism called simply *phalgunī*, this would not prove that such an asterism ever formed a member in a series of twenty-four *nakshatras*.

The name *anurādhā* finally, meaning 'that which follows on *rādhā*,' has no force whatever, to prove that the two stations were originally considered as one only, not any more than the name of the Arab *Manzil al-Debarān, i.e.,* 'the following one,' proves that station to have been at first one with the preceding station, *viz., Thurayyā,* the Pleiades. Had *rādhā* and *anurādhā, i.e., α, β, δ, ι* Libræ and *β, δ, π,* Scorpionis, ever constituted one primitive station, we might, moreover, reasonably expect to meet with the same stars combined in one group in the primitive Babylonian series assumed by Professor Hommel. But this is distinctly not the case, for we there find *α* and *β* Libræ as *Zibānītu*

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1 As has been raised beyond doubt by Professor Weber, in the course of the lengthy controversies carried on by him with several other scholars, concerning the original character of the *nakshatras.*

(Balance), and δ and β Scorpionis as *Riš-akrabi.* (Head of the Scorpion). It would be of interest, could we apply this latter test also to the three *pūrva* and *uttara* pairs of the Hindu series. The Babylonian list, how-ever, exhibits not any stars either of Sagittarius—in which the two *Ashāḍhās* of the Hindus are situated—nor of Pegasus, and Andro-meda, to which the two *Bhadrapadas* belong. Of the three stars, on the other hand, which constitute *pūrva* and *uttara-phalgunī* (*viz.*, θ and δ Leonis; β Leonis) one only, indeed, *viz.*, β, occurs in Pro-fessor Hommel's list; but another (*viz.*, θ) is added in Epping's list (*Z. f. A.*, December 1892), and as the names of the two are *zibbat-arū* (tail of the Lion) and *zibbat-kalab* (?) *arū*, it seems that here the Baby-lonians also viewed the stars of two stations, as forming one group only.

There is, of course, no better positive historical evidence for the *Menāzil* of the Arabs ever having been less than twenty-eight, than there is in the case of the *nakshatras*. In one case (*viz.*, that of the two *Fargh*) we have a designation which, in a manner analogous to that of the Hindus, points to two stations being viewed as parts of one large constellation; but the case is the most striking one of the three men-tioned above, in which this mental combination is almost inevitably pro-voked by the configuration of the group. In the case of the three other *menāzil* (*aṣ-Ṣarfa ; al-Iklīl ; al-Balda*), which Professor Hommel is inclined to view as having sprung from the later subdivision of large groups of stars into two stations, there is no other reason than the hypothetical later bi-partition of the corresponding asterisms of the Hindu Series. Professor Hommel wishes to connect the amplification of the assumed original series of twenty-four *menāzil* into the known one of twenty-eight, with the introduction of Hindu astronomical doc-trines into Islamitic countries. But this hypothesis has absolutely no-thing to rest on.

We now advance to the last step in Professor Hommel's argumenta-tion, *viz.*, the attempt to show that the series of asterisms composing the different lunar zodiacs is fundamentally identical with the stars and groups of stars which the Chaldean Astronomers employed as their normal stars. This is clearly the most important link in the chain of attempted proof. What we have considered so far might indeed be termed merely preliminary, or even comparatively irrelevant. It does not, after all, greatly matter—an advocate of the Babylonian origin of the lunar zodiacs might say—whether the stations of the Hindus, Arabs, and Chinese were originally twenty-four or not; nor whether the Babylonian normal stars can be shown, or not, to fall into twenty-four groups; nor what the exact historical relation of the stations of the Arabs and Hindus may have been; nor how far the star groups of

the Babylonians on the one side and those of the three nations on the other side, agreed or differed, as far as practical use is concerned. As long as it can be shown that the two series of asterisms comprise, on the whole, the very same stars or groups of stars; it remains the most probable hypothesis that the selection of the asterisms was originally made in one place, and that the zodiac thus established was later on borrowed by the other nations. Various differences,—which need not be minor ones only—may have sprung up later on; one or more nations may for purposes of their own have subdivided some of the primitive asterisms into parts, so as to increase the total number; one nation may have regarded the stations chiefly in so far as announcing, by their suc-cessive risings, the seasons of the year; another nation may have used them, prevailingly, as marking certain subdivisions of the Ecliptic which were required for facility of astronomical computation; the asterisms may have come to be viewed as mansions of the moon in one place and as mansions of the sun in another place; and in a third place they may have come to be practically used only as affording fixed points of refer-ence for the ever-moving planets. All this does not suffice to refute— or even appreciably to diminish the probability of—the view that four zodiacs which are identical, as far as the majority of their constituent groups is concerned, are nothing but modifications of one and the same prototype. Nor can we in the present case look for that original zodiac anywhere else than in Babylon, which we now view with even much better reason than twenty years ago as the cradle of all astronomical science.

The reply to this is that, as a closer examination of the facts will show, the agreement of the Babylonian Series of stars with the lunar zodiacs of the other nations is by no means so close as to compel or even to render probable the derivation of the latter from the former. In attempting to decide the question whether the partial identity of the two series of asterisms entitles us to infer a historical connexion be-tween them, we must take care clearly to represent to ourselves the conditions of the problem, so as to distinguish what has true proving force from what has not. In doing so, we may, as Professor Hommel does in that part of his enquiry which here immediately concerns us, confine our attention to the Babylonian normal stars on the one hand, and the Arabian *menāzil* on the other hand; as the latter approx-imate most closely to the Babylonian Series, the whole argument may, indeed, with advantage be confined to them. Now, what we positively and certainly know about the two series to be compared is, that the Arabs had a kind of zodiac comprising twenty-eight stars or groups of stars, to which they referred the motions of the moon and sun, and whose

risings indicated to them the different seasons; while the Babylonians had a series of stars, to which they referred the motions of the planets. In addition, we may allow, that the normal stars of the Babylonians may—following certain indications given by their nomenclature—be combined in a number of groups, let us say, twenty-four, as Professor Hommel thinks. The question then is whether the similarity of the two series of asterisms extends so far as to render it more probable that the two series go back to one and the same original, than that they were formed independently. Now it is clear that people, bent on establishing on the one hand, a series of what we may call luni-solar Mansions, and on the other hand, Astronomers wishing to select a series of stars to which the places of the planets can be referred, work under conditions from which the partial identity of the stars or star-groups selected follows with absolute necessity. In both cases, asterisms had to be selected which lay within the track of sun, moon, or planets, *i.e.,* asterisms lying on, or not far from, the Ecliptic. It, therefore, was in each case inevitable that specially brilliant stars which had the required position should be included within the Series. To this class belong α Tauri (*Al-Debarān*; *pidnu*); α Leonis (*al-Gabba*; *šarru*); α Virginis (*as-Simāk*; *nābū ardati*); α Scorpionis (*al-Ḳalb*; *ḫabrud*); all of them stars of the first magnitude, and either on, or quite close to, the Ecliptic. The presence of these stars in two series, of course, proves nothing whatever as to their historical inter-dependence.

The same remark may safely be extended to certain well-defined and conspicuous groups of stars which lie close to the Ecliptic, even if they do not contain stars of the first magnitude. To this class belong the Pleiades (*al-ṭurayyā*; *timinnu*); α and β Geminorum (*ad-dirā*; *tu'āmi*), a conspicuous pair of stars of the second magnitude; and perhaps also, α and β Libræ, two stars of the third magnitude, one of which lies on the Ecliptic. These groups also could not be omitted by any one who in selecting asterisms was bound to follow the track of sun, moon, and planets. In order to be convinced that two zodiacs are historically connected, we require to meet with coincidences of an altogether different kind, *viz.*, with coincidences in cases where the absence of coincidence would not be surprising or possibly even *à priori* probable. This point may be well illustrated by reference to the lunar zodiacs of the Arabs, Hindūs and Chinese. What has, one may ask, driven the majority of scholars who have given that subject their attention, to the conclusion that those three zodiacs have not been formed independently of one other? In the first place, no doubt, the mere fact that they comprise each twenty-eight or twenty-seven members, and are thus marked out as lunar zodiacs. This circumstance

however, would by itself be hardly sufficient to establish the conclusion in question ; for the idea of laying out a zodiac in special connection with the periodic revolution of the moon is, if not an obvious one, at any rate such as may possibly occur to different individuals or nations independently.  The argument, therefore, really hinges on a second circumstance, *viz.*, the identity or partial identity of the asterisms constituting the different zodiacs.  But here also the distinction made above, has to be kept in view, and has actually been kept in view by all competent enquirers.  That the Arabs, Hindūs and Chinese alike, include within their zodiacs, stars like Aldebarān and Spica, and groups of stars like the Pleïades, and $\alpha$ and $\beta$ Geminorum, can convince, and has convinced, nobody of the original connection of the three series ; for in all such cases the selection was a matter of necessity rather than choice. But something like conviction begins to form itself when we meet with cases where the three nations although free to take different lines, agree in following one and the same track.  The coincidences falling under this head are not numerous ; but some of them are highly striking. There is, in the first place, the choice of three faint stars in Orion's head ($\lambda$, $\theta$,[1] $\theta^2$) to constitute the *al-haka* of the Arabs, the *Mṛigaçiras* of the Hindūs, the *Tse* of the Chinese.  There next is the choice of certain stars in the tail of the Scorpion, which lie at a considerable distance south of the Ecliptic to mark the *aš-šaula* of the Arabs, the *Mūla* of the Hindus, and the *Wēi* of the Chinese.  There further is the fact that all the three zodiacs agree in marking two of their stations by the stars constituting the so-called square in Pegasus, although all those stars have a high northern latitude (the two *Bhadrapadās* of the Hindūs, the two *Farghs* of the Arabs, *She* and *Pi* of the Chinese).  To the same class of cases belongs the selection—met with, however, in the Hindu and Arab zodiacs only—of two stars of the third magnitude ($\delta$ and $\theta$ Leonis), which both have a high northern latitude, to constitute the *Pūrva Phalgunī* of the Hindus, and the *Chang* of the Chinese.  We may also, I think, mention, under this heading, the inclusion within the series of the small stars 35, 39 *a*. 41 *Arietis*—which form the *Bharaṇī* of the Hindus, the *al-Buṭain* of the Arabs, and the *Wei* of the Chinese ; and perhaps, also, the fact that certain little conspicuous stars in Hydra—which, moreover, do not lie very close to the Ecliptic—were selected to constitute the *Açleshās* of the Hindus and the *Lieu* of the Chinese.  In this last case, however, the Arab Zodiac deviates from the two others, in keeping close to the Ecliptic.  But, even if we abstract from the less striking cases, there remain a number of coincidences so remarkable that the hypothesis of a common origin of the three lunar zodiacs suggests itself almost inevitably.  If, on the

other hand, these striking coincidences were absent, the whole theory of a primitive connexion of the three zodiacs would enormously lose in probability. Of the selection of the three faint stars in Orion's head, Professor Whitney says,[1] that 'it is not a little strange that the framers of the system should have chosen for marking the third station, this faint group, to the neglect of the brilliant and conspicuous pair, $\beta$, and $\zeta$, Tauri. There is hardly another case where we have so much reason to find fault with their selection.' The choice is indeed an unaccountable, apparently irrational one ; but it, of course, is just this agreement in apparent irrationality which most strongly supports the view of the three zodiacs being derived from one original.

If, therefore, the series of Babylonian normal stars was originally connected with the lunar zodiacs, we should expect to find that it agrees with them in the striking peculiarities just enumerated, or, at least, in some of them. But on an examination of the actual state of things, our expectations are totally disappointed. From Aldebarān, the Babylonian Series advances, not to the stars in the head of Orion, but just to those stars which form the natural next link in an ecliptical series, viz , $\beta$ and $\zeta$ Tauri. In Leo, again, it keeps to the ecliptic, in taking in $\rho$ before going up to $\theta$ ; the brilliant star $\beta$, Leonis, it leaves aside. It does not go to the south of the Ecliptic, to take in the stars in the Scorpion's tail, but has, in their stead, $\theta$ Ophiuchi, which is situated close to the Ecliptic. It does not go up to the north, to take in stars from Pegasus and Andromeda. It comprises none of the stars which constitute the *Bharaṇī* of the Hindus, and the corresponding stations of the two other nations. In short, wherever the three lunar zodiacs coincide in a striking and characteristic way, the series of Babylonian normal stars deviates from them and follows its own track.

We might add to this list of characteristic deviations of the Babylonian Series if we look for one member of the comparison in an hypothetical primitive lunar zodiac, as *e.g.*, construed by Professor Whitney, (Lunar Zodiac, p. 357). We should in that case, have to point out that where the primitive zodiac—as represented by *Āçleshās* and *Lieu*—goes down to the south, so as to take in stars from Hydra, the Babylonian Series sticks to the Ecliptic, selecting stars from Cancer. But as in this case the Arab Zodiac agrees with the Babylonian Series, it is more advisable to omit all reference to the hypothetical primitive zodiac.

There now certainly remains a small number of cases in which the Babylonian Series agrees with the lunar zodiac, and where, at the same time, the agreement cannot exactly be called an inevitable one. But I do

[1] *The Lunar Zodiac; Oriental and Linguistic Essays,* p. 351.

not think that anybody who carefully examines these agreements will consider them sufficiently strong, especially when remembering the absence of agreement in all truly characteristic cases, in what, in fact, may be called test cases of the hypothesis of original connexion. I rather think it probable that any one following, in a Stellar Map, the track of the Babylonian normal stars and of the Arabian *menāzil* will be inclined to include in the list of inevitable coincidences several cases not thus classed by me above. At the same time, there are minor discrepancies which might be urged. It was, *e.g.*, as good as inevitable that a series of stars, bound not to wander too far from the Ecliptic, should contain some of the more conspicuous stars of Aries. Accordingly, β Arietis appears both in the Babylonian and the Arab Series; but while the Babylonians add the brilliant star α Arietis, the Arabs omit α and join β and γ, as *Sharaṭān*. In Gemini η and μ, a pair of stars of the third magnitude, lying quite close to the Ecliptic, could hardly be omitted. Nor could δ and γ Cancri, or at least the former of these two stars, be absent from an Ecliptic Series.

The same remark applies to β η γ, Virginis. It is, on the other hand, surprising that neither κ nor λ, Virginis—which appear in the station *al-ghafr*—are included in the Babylonian Series. For Scorpio δ and β, two stars lying close to the south and north of the Ecliptic could hardly be overlooked. In the region where α and β Capricorni are situated, there are absolutely no other stars but these two, which could be included in an Ecliptic Series. A choice, on the other hand, was possible a little further on; and there we meet again with a noteworthy discrepancy, the Babylonian Series taking the stars closest to the Ecliptic, *viz.*, γ and δ Capricorni, while the corresponding *manzil*—*as-su'ūd*—comprises β and ξ Aquarii, which are situated more to the north. Where finally the Babylonian list has η, Piscium, not very far from the Ecliptic, the Arab *manzil* goes as far north as β Andromedæ.

With regard to some of the discrepancies here noted, Professor Hommel directs attention to the circumstance that the stars comprised in the Babylonian Series, on the one hand, and the Arab Series on the other hand, have, at any rate, nearly the same longitude; and seems to consider this as a sign of the original identity of the two series. But this circumstance really proves nothing. That the groups of stars actually chosen occasionally have almost the same longitude, naturally follows from the conditions of the task the Babylonians as well as the Arabs had set themselves, *viz.*, of dividing the Ecliptic by stars, or star groups, into 28 or, let us say, 30–36 parts.

The various considerations set forth in what precedes, render it in my opinion, altogether impossible to look on the normal stars of the

Babylonian Tablets as the original of the different lunar zodiacs. As said at the outset of this paper, the hypothesis of Babylon having been the place where such a zodiac was first established was not an unlikely one, at a time when hardly any thing authentic was known about Babylonian Astronomy. But at present that hypothesis has greatly lost in probability. We now know, from authentic Babylonian sources, that the Chaldeans, from an early time, distinguished twelve zodiacal constellations, and referred to them, or else to certain definite stars in them, the positions of the planets. The number of those definite stars, or star-groups, amounted, in later times at any rate, to more than thirty, perhaps thirty-six. It is possible that an earlier series, used for the same purposes, consisted of twenty-four members only. But there are no traces of any series consisting of that number of stations which is characteristic of a lunar zodiac, *viz.*, twenty-seven or twenty-eight. Nor is there anything like a characteristic agreement between the stars and star-groups, constituting the lunar zodiacs of the Hindus, Arabs and Chinese, and the series of normal stars used by the Babylonian Astronomers. The conclusion to be drawn from all this, is that the hypothesis of the Babylonian origin of the *Nakshatras, Manzils* and *Sieu* has, for the present at least, to be set resolutely aside.